Biodiversity Data Journal 2: e1042
doi: 10.3897/BDJ.2.e1042

open access

Taxonomic paper

First record of Eggplant Mealybug, *Coccidohystrix insolita* (Hemiptera: Pseudococcidae), on Guam: Potentially a major pest

Aubrey Moore†, Gillian W. Watson‡, Jesse Bamba§

† Western Pacific Tropical Research Center, University of Guam, Mangilao, Guam, United States of America
‡ California Department of Food and Agriculture, Sacramento, California, United States of America
§ Cooperative Extension Service, University of Guam, Mangilao, Guam, United States of America

Corresponding author: Aubrey Moore (aubreymoore@guam.net)

Academic editor: Laurence Livermore

Received: 17 Dec 2013 | Accepted: 18 Jan 2014 | Published: 23 Jan 2014

Citation: Moore A, Watson G, Bamba J (2014) First record of Eggplant Mealybug, *Coccidohystrix insolita* (Hemiptera: Pseudococcidae), on Guam: Potentially a major pest. Biodiversity Data Journal 2: e1042. doi: 10.3897/BDJ.2.e1042

Abstract

The eggplant mealybug, *Coccidohystrix insolita* (Green) (Hemiptera: Pseudococcidae), is recorded from the island of Guam in the Mariana Islands for the first time. Factors indicating that this introduced mealybug has the potential to become a pest of economic importance for agriculture and horticulture on Guam are discussed.

Keywords

Coccidohystrix insolita, eggplant mealybug, invasive species

Introduction

The eggplant mealybug, *Coccidohystrix insolita* (Green) is broadly distributed in the tropics and subtropics and well known as a agricultural and horticultural pest (Lit et al. 1998,

© Moore A et al. This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Williams 2004, Williams and Watson 1988). This article documents the first detection of *C. insolita* on Guam.

Mealybugs producing long ovisacs were found infesting the lower leaf surfaces of eggplant, *Solanum melongena* L., in a farmer's field on Guam on December 4, 2013 (Figs 1, 2, 3). Samples of infested leaves were preserved in ethanol for subsequent identification at the California Department of Food and Agriculture Diagnostic Center in Sacramento, California. Diagnosis was based on morphology of adult females mounted on microscope slides.

Figure 1.

Adult *Coccidohystrix insolita* females with ovisacs.

Figure 2.

Coccidohystrix insolita nymphs.

Figure 3.

Eggplant (*Solanum melongena* L.) leaf underside infested with *Coccidohystrix insolita*.

Materials and methods

Infested leaves were collected into bags and taken to the laboratory. Color photographs were taken to record the appearance of the insects in life using a Leica EZ4HD dissection microscope. Infested leaf fragments were preserved in 70% ethanol and sent to the Plant Pest Diagnostic laboratory of California Department of Food and Agriculture (CDFA-PPDC) for diagnosis. A total of seven adult female specimens were selected and prepared on three microscope slides using the method given by Sirisena et al. 2013. The specimens were studied using a Nikon Eclipse 80i compound microscope with phase contrast illumination and ×30 – ×600 magnification, and were identified using the keys in Williams and Watson 1988 and Williams 2004. Slide-mounted voucher specimens will be deposited in the California State Arthropod Collection at CDFA-PPDC in Sacramento, California.

Taxon treatment

Coccidohystrix insolita (Green, 1908)

Material

a. islandGroup: Mariana Islands; island: Guam; municipality: Dededo; locality: near Swamp Road; decimalLatitude: 13.539981; decimalLongitude: 144.83435; samplingProtocol: eggplant leaf samples; eventDate: 2013-12-04; sex: 7 slide-mounted adult females were examined; catalogNumber: AM20131204.002; occurrenceRemarks: on eggplant leaves; recordedBy: Jesse Bamba; identifiedBy: Gillian W. Watson; dateIdentified: 2013-12-13; collectionID: ESUG; institutionCode: UGUAM; basisOfRecord: LivingSpecimen; source: http://guaminsects.myspecies.info/node/2623

Diagnosis

9-segmented; posterior ostioles present, anterior ostioles absent; cerarii on margins numbering 17 pairs, numerous dorsal cerarii present also, each cerarius consisting of 1–15 large conical setae situated on a sclerotized prominence, without any associated trilocular pores; legs well developed, each claw with a denticle present on plantar surface; circulus absent; anal lobes well developed, each with a sclerotized ventral bar; quinquelocular pores numerous on venter; multilocular disc pores numerous on venter of abdominal segments III-IX, a few also present on the venter of segments I and II and on the dorsum of segment VII; ventral oral collar ducts present on submargins of abdominal segments V-VIII; oral rim ducts absent entirely.

Diagnosis was based Williams 2004 which includes a good taxonomic illustration of *C. insolita*.

Distribution

C. insolita has been recorded in the literature from the following regions and countries:

Afrotropical: Kenya, Madagascar, Rodriques Island (Mauritius), South Africa, Tanzania, Zanzibar; **Australasian**: Western Samoa; **Oriental**: Bangladesh, Burma (=Myanmar), India, Laos, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam; **Palaearctic**: China, Saudi Arabia (Ben-Dov 2013).

In addition, a Japanese quarantine inspector found *C. insolita* on *Alternanthera* (Amaranthaceae) imported from Singapore (Tokihiro 2006).

Prior to our discovery on Guam, *C. insolita* was known only from two Pacific island nations: the Philippines and Western Samoa. *C. insolita* was first detected in the Philippines during 1994 (Lit et al. 1998) and in Western Samoa in 1966 (Williams and Watson 1988).

Biology

Coccidohystrix insolita lives on the leaves (Fig. 3).

Notes

The appearance of *C. insolita* in life is unusual for a mealybug because the adult female has very little dorsal wax and secretes a white, waxy ovisac up to 6 times as long as the body of the female (Fig. 1), which is more typical of some Coccidae. The immature stages do not secrete a thick layer of mealy wax, the body being shiny yellow-green with submedian grey spots on 2 abdominal and 1 thoracic segments (Fig. 2). This contrasts with the in life appearance of the solenopsis mealybug, *Phenacoccus solenopsis* Tinsley, in which all developmental stages develop a thick layer of white

mealy wax except for two longitudinal lines of bare cuticle that expose dark submedian spots on 3 or 4 segments on the abdomen and 1 or 2 on the thorax.

Host Plants

C. insolita is polyphagous and is recorded from the following families of host plants (Ben-Dov 2013): Acanthaceae, Amaranthaceae, Apocynaceae, Araceae, Arecaceae, Aristolochiaceae, Asteraceae, Chenopodiaceae, Cucurbitaceae, Euphorbiaceae, Fabaceae, Malvaceae, Menispermaceae, Moraceae, Poaceae, Rhamnaceae, Rubiaceae, Solanaceae, Sterculiaceae, Tiliaceae, Zygophyllaceae.

Many plants belonging to these families are important to agriculture and forestry on Guam.

Parasitoids

Twenty-three species of hymenopterous parasitoids are associated with *C. insolita* (Noyes 2013):

Aphelinidae: *Coccophagus pseudococci*; **Encyrtidae:** *Adektitopus longipennis*, *Anagyrus gracilis*, *Apoleptomastix bicoloricornis*, *Blepyrus insularis*, *Gyranusoidea signata*, *Homalotylus albiclavatus*, *Homalotylus hemipterinus*, *Homalotylus indicus*, *Homalotylus turkmenicus*, *Leptomastix nigrocincta*, *Leptomastix nigrocoxalis*, *Neocharitopus orientalis*, *Paranathrix tachikawai*, *Prochiloneurus albifuniculus*, *Prochiloneurus pulchellus*; **Eulophidae:** *Aprostocetus ajmerensis*, *Aprostocetus annulicornis*, *Aprostocetus jaipurensis*; **Pteromalidae:** *Catolaccus crassiceps*; **Signiphoridae:** *Chartocerus hyalipennis*, *Chartocerus kerrichi*, *Chartocerus kurdjumovi.*

None of these species are known to exist on Guam and there were no signs of parasitism in the specimens examined.

Other Natural Enemies

The following natural enemies have been recorded attacking *C. insolita*: **Fungi:** *Metarhizium anisopliae*; **Insecta: Coleoptera: Coccinellidae:** *Anegleis cardoni* (Weise); *Hyperaspis maindronia*; *Nephus regularis*; **Lepidoptera:** Lycaenidae: *Spalgis epeus* (Ben-Dov 2013). None of the insect predators are known to exist on Guam.

Attendant Ants

Three species of attendant ants are associated with *C. insolita*: Dolichoderus bituberculatus, *Solenopsis geminata*, *Anoplolepis gracilipes* (Ben-Dov 2013). The latter two species are abundant on Guam but so far, we have not yet seen any ant associations with *C. insolita*.

Discussion

Guam, like all small tropical islands, is susceptible to damage from invasive species because of a warm climate with no winter, coupled with a lack of natural enemies for many new arrivals. It is difficult to predict the eventual pest status of any newly detected invasive insect species, but *C. insolita* has the hallmarks of being a major pest on Guam for several reasons:

1. **Plant hosts.** Many of the known host plants of *C. insolita* are commonly grown as crops on Guam. In addition several others, such as coconut palm, *Cocos nucifera*, and *Hibiscus* spp. are major components of natural and ornamental vegetation.
2. **Escape from natural enemies.** None of the parasitoids or predators known to attack *C. insolita* are known to exist on Guam. Despite the fact that several parasitoids and predators pre-existed in the Philippines prior to arrival of *C. insolita*, this species became a major agricultural pest (Lit et al. 1998). It is likely that implementation of biological control will be required to prevent major economic and environmental damage by this pest on Guam.
3. **Attendant ants.** Two of the three ants known to form a commensal relationship with *C. insolita*, namely *Anoplolepis gracilipes* and *Solenopsis geminata*, are common on Guam. In addition, several other ant species which readily establish associations with mealybugs are present. Attendant ants protect mealybugs from parasitism and predation, making it difficult to establish biological control.
4. **Origin.** Guam is an unincorporated territory of the United States of America (U.S.). Experience has shown that invasive species which originate from outside of the U.S., such as this one, are harder to deal with than those accidentally imported from the U.S. mainland or Hawaii. For invasive insect species already present in the U.S., control resources are usually readily available. Often research has been done, control methods have been developed, biological control agents have been identified, an exploratory entomologist has been sent out to collect candidate species, and these have been imported, cultured and tested, and are available for use on Guam. However, resources are scant when it comes to responding to invasive species of non-U.S. origin.
5. **Rapid Response Capacity.** There is currently a critical lack of capacity to deal with entomological problems on Guam and in the rest of Micronesia. The number of Ph.D. level entomologists practicing on Guam and in the rest of Micronesia has decreased from nine during the mid-1990s to only three at present.
6. **Biological Control Agent Import Permits.** Guam is required to comply with U.S. Department of Agriculture regulations for importing biological control agents. These requirements are far more stringent for organisms originating outside of the U.S. than for those imported from within the U.S. Delays in the permitting process and a lack of capacity to comply with permit conditions sometimes impede rapid progress towards establishment of biological control in time to prevent major economic and environmental damage. Often, there is a pest population explosion prior to

implementation of biological control. During this initial outbreak, risk of accidental export to trading partners is high.

References

- Ben-Dov Y (2013) ScaleNet. *Coccidohystrix insolita*. Accessed 16 December 2013. URL: http://www.sel.barc.usda.gov/catalogs/Pseudoco/Coccidohystrixinsolita.htm#Coccidohystrixinsolita
- Lit IJ, Caasi-Lit M, Calilung V (1998) The mealybugs (Pseudococcidae, Coccoidea, Hemiptera) of egglant (Solanum melongena Linn.) in the Philippines. Philippine Entomologist 12 (1): 29-41.
- Noyes JS (2013) Universal Chalcidoidea Database. Query result for parasitoids of *Coccidohystrix insolita*. Accessed 14 December 2013. URL: http://goo.gl/Wp2J7c
- Sirisena UG, Watson GW, Hemachandra KS, Wijayagunasekara HN (2013) Preparation of Hemiptera: Sternorrhyncha for identification. Tropical Agricultural Research Journal 24 (2): 139-149. [In English]. URL: http://www.pgia.ac.lk/sites/default/files/congress/journel/w24/Journal-No%202/Papers/3-_12%20_-Sirisena-NEW-OK.pdf
- Tokihiro G (2006) List of mealybugs (Homoptera: Pseudococcidae) intercepted at Japanese Plant Quarantine mainly from areas without a record of distribution. Research Bulletin of the Plant Protection Service, Japan 42: 65-67. URL: http://www.maff.go.jp/pps/j/guidance/r_bulletin/pdf/rb042_010.pdf
- Williams DJ (2004) Mealybugs of southern Asia. Southdene SDN. BHD., Kuala Lumpur, 896 pp. [In English]. [ISBN 983-40053-6-9]
- Williams DJ, Watson GW (1988) The scale insects of the tropical South Pacific region. Part 2. The mealybugs (Pseudococcidae). CAB International, Wallingford, 260 pp. [In English]. [ISBN 085198 607 2]